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(71) Applicant(s)
Samsung Electronics Co Limited

(Incorporated in the Republic of Korea)

416 Maetan-dong, Paldal-gu, Suwon-City, Kyungki-do, Republic of Korea

(72) Inventor(s)
Kwang-Soo Jung

(74) Agent and/or Address for Service
Christopher Stephen Tunstall
Dibb Lupton Alsop, 117 The Headrow, LEEDS, West Yorkshire, LS1 5JX, United Kingdom

(54) Keypad illumination circuit for a portable telephone

(57) A flip-type portable telephone includes means to turn keypad illumination D1-D8 on or off in response to the open or closed position of the flip. There is no delay in turning the illumination off, thus saving power.

The flip position sensing means comprises a switch 14 mounted in the body of the telephone operated by a magnet 20 mounted in the flip.

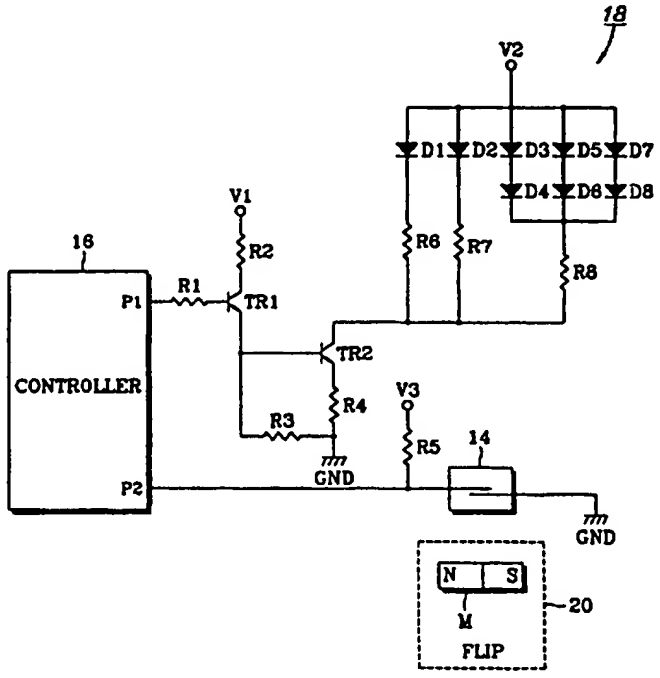

Fig. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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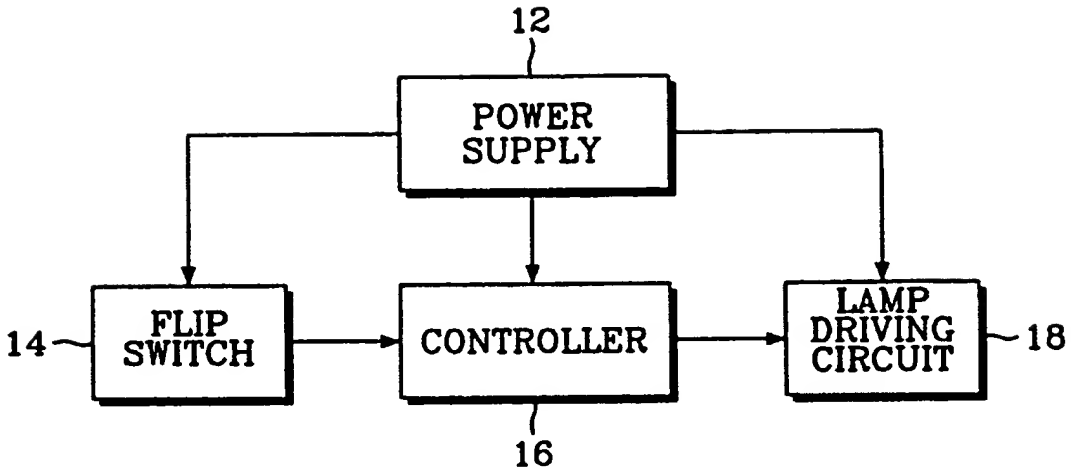
12
POWER SUPPLY
14
FLIP SWITCH
CONTROLLER
LAMP DRIVING CIRCUIT
18
16

Fig. 1

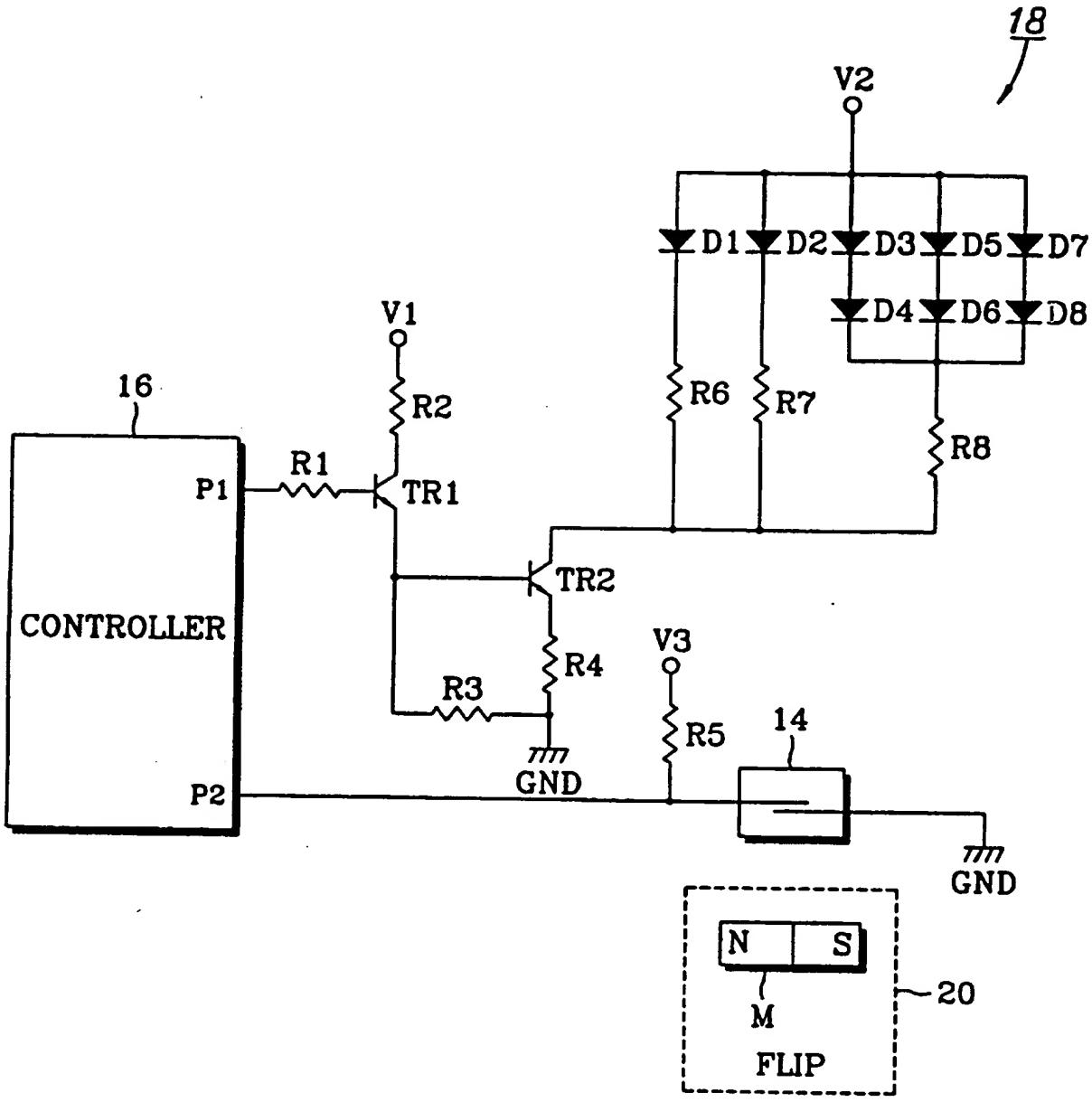
18
V2
D1
D2
D3
D5
D7
D4
D6
D8
V1
16
R2
R6
R7
R8
R1
P1
TR1
TR2
CONTROLLER
V3
R4
R3
R5
14
GND
P2
GND
N
S
M
20
FLIP

Fig. 2

It is therefore an object of the present invention to provide a flip-type cellular telephone with a circuit for minimizing battery consumption of panel lamps.

It is another object of the present invention to provide a flip-type cellular telephone with a circuit for turning panel lamps on/off in response to an opened/closed status of a flip.

According to the invention, there is provided a portable telephone for controlling panel lamps in a portable telephone including a power supply, comprising:

a flip capable of being opened and closed, the flip being mounted on a body of the portable telephone;

control means for controlling power supplied to the lamps so that the lamps are turned on when the flip is opened and turned off when the flip is closed.

In a preferred embodiment, the portable telephone includes flip status sensing means for sensing an opened/closed status of the flip. Preferably, the flip status sensing means generates a flip status sensing signal; and the control means controls the power supplied to the lamps in response to the flip status sensing signal. Preferably, the control means generates a lamp on/off control signal.

In a preferred embodiment, lamp driving means are provided for providing power to the panel lamps in response to the lamp-on control signal from the control means to turn the panel lamps on, and for cutting off the power to the panel lamps in response to the lamp off control signal to turn the panel lamps off.

In a preferred embodiment, the flip comprises a first coupling means and the body comprises a second

coupling means at a location in proximity with the first coupling means when the flip is closed, whereby, when the flip is closed, the first and second coupling means interact as a result of their proximity to one another to indicate the open/closed status of the flip. Preferably, the first coupling means comprises a magnet. The magnet may be a permanent magnet. Preferably, the second coupling means comprises a magnet switch mounted on the body of the telephone at a location corresponding to the location of the magnet in the flip when the flip is closed, whereby the magnet switch is turned on or off depending on the proximity of the magnet in the flip and hence the open/closed status of the flip.

The panel lamps may be arranged to brighten the circumferences of key buttons in the panel.

The invention also extends to a circuit embodying the features described in the preceding paragraphs.

According to an aspect of the present invention, a portable telephone for controlling panel lamps in a cellular telephone having a power supply for supplying a power of a constant voltage level and a flip includes, a flip status sensing circuit for sensing an opened/closed status of the flip to generate a flip status sensing signal, a control circuit supplied with the power for generating a lamp-on/off control signal in response to the flip status sensing signal, and a driving circuit for providing the panel lamps with the power in response to the lamp-on control signal output from the control circuit to turn the panel lamps on and for cutting-off the power supplied to the panel lamps in response to the lamp-off control signal to turn the panel lamps off.

An embodiment of the invention will now be described by way of example only with reference to the following figures.

Fig. 1 is a block diagram of a circuit for

controlling panel lamps in a flip-type cellular telephone according to an embodiment of the present invention; and

Fig. 2 is a detailed circuit diagram of the circuit for controlling panel lamps according to an embodiment of the present invention.

Referring to Fig. 1, a circuit for controlling panel lamps in a cellular telephone according to an embodiment of the present invention is shown. The circuit includes a power supply 12 for supplying a power of a constant voltage level and a flip switch for switching the power on/off according to an opened/closed status of a flip (not shown) to generate a flip status sensing signal. The circuit also includes a controller 16 which is supplied with the power and which generates a lamp-on/off control signal output in response to the flip status sensing signal generated from the flip switch 14. There is also a lamp driving circuit for providing the panel lamps with the power so as to turn the panel lamps on in response to the lamp-on control signal output from the controller 16 and for cutting-off the power supplied to the panel lamps in response to the lamp-off control signal so as to turn the panel lamps off.

In the drawing, the flip switch 14 is a magnet switch which is activated when a magnet attached to or within a specific location of the flip is brought close to it. Magnet switches are well known to those skilled in the art. For example, these could include a magnet, coil or relay-type device. The controller 16 is comprised of a one-chip microprocessor or a plurality of logic combination circuits. It should be noted that the controller 16 described is a microprocessor in this particular embodiment.

Referring to Fig. 2, a detailed circuit diagram of the panel lamp control circuit according to the present invention is shown. This illustrates how the flip switch 14, the controller 16 and the lamp driving circuit 18 are

connected.

In the drawing, reference numeral 16 represents the controller and reference numeral 14 represents the flip switch comprising of the magnet switch described in connection with Fig. 1. A flip 20 includes a magnet M mounted on an upper central part of the flip so that the magnet M is positioned close to the flip switch 14 when the flip 20 is closed. A flip (not shown) incorporates the speaker or the microphone of the telephone. The lamp driving circuit 18 includes a plurality of lamps connected between a switching element and a power V2, in which the switching element is a bipolar transistor and the lamps are light emission displays (LEDs).

Referring again Figs. 1 and 2, operation of the lamps D1-D8 responding to the opening/closing of the flip 20 will be described below in detail.

If the user opens the flip 20 to use the telephone, the magnet M mounted on the flip 20 separates from the flip switch 14. The flip switch 14 turns off, and a port P2 of the controller 16 goes to a logic "high" state by means of a pull-up resistor R5 connected between the port P2 and a power source V3. The power source V3 is supplied by the power supply 12 and provides power to the port P2 of the controller 16.

The controller 16 scans the voltage level at the port P2 periodically, to check the opened/closed status of the flip 20. For instance, the controller 16 determines the flip 20 as being opened when the port P2 is at the logic "high" state and otherwise, as being closed when the port P2 is at the logic "low" state.

According to the voltage level at the port P2, the controller 16 generates an output voltage at a port P1. The controller 16 generates the logic "high" state at the port P1 when the flip 20 is determined as being open,

according to the preferred embodiment of the present invention.

Then, a transistor TR1 having a base connected to the port P1 via a resistor R1 is turned on in response to the logic "high" state at the port P1. As a result, a transistor TR2 with a base connected to an emitter of the transistor TR1 is turned on, thereby forming a current path between a collector and an emitter thereof. Therefore, the lamps D1-D8 connected between the power source V2 supplied by power supply 12 and the collector of the transistor TR2 are all turned on. As described above, the lamps D1-D8 are mounted under the key buttons of the cellular telephone, to brighten the key buttons or, for example, to brighten the circumferences of the key buttons for the user's convenience.

The lamps D1-D8 are automatically turned off upon elapsing of a preset time, under the control of the controller 16. For example, if the flip 20 is opened while the user speaks over the telephone and the preset time elapses, the controller 16 generates the logic "low" state at the port P1 to automatically turn the lamps D1-D8 off.

On the contrary, if the flip 20 is closed before the preset time elapses, the magnet M of the flip 20 is brought close to the flip switch 14 by the action of closing the flip and thus, the flip switch 14 is turned on by the magnetic force.

Accordingly, the pull-up voltage V3 from the power supply 12 is bypassed to the ground GND via the resistor R5 through the flip switch 14 and the port P2 of the controller 16 goes to the logic "low" state.

Then, the controller 16 generates the logic "low" state at the port P1 upon detecting the logic "low" state at the port P2. The transistor TR1 is then turned off.

Also, the transistor TR2 with the base connected to the emitter of the transistor TR1 is turned off. As a result, the current path between the power V2 supplied from the power supply 12 and the ground GND is cutoff, resulting in the lamps D1-D8 being turned off. In other words, the cathode electrodes of the LEDs with anode electrodes connected to the power source V2 are cut from the ground GND, thereby cutting off the current path.

In conclusion, the panel lamp control circuit according to the present invention controls the back-light in response to the opened/closed status of the flip and the panel lamps are turned off upon closing the flip, thereby reducing the consumption of the current and saving battery power.

It will be apparent to those skilled in the art that whereas a permanent magnet is preferred since it does not draw power, an electromagnet could be used.

CLAIMS

1. A portable telephone for controlling panel lamps in a portable telephone including a power supply, comprising:

a flip capable of being opened and closed, the flip being mounted on a body of the portable telephone;

control means for controlling power supplied to the lamps so that the lamps are turned on when the flip is opened and turned off when the flip is closed.

2. A portable telephone according to claim 1, comprising:

flip status sensing means for sensing an opened/closed status of the flip.

3. A portable telephone according to claim 2, in which

the flip status sensing means generates a flip status sensing signal; and

the control means controls the power supplied to the lamps in response to the flip status sensing signal.

4. A portable telephone according to any preceding claim in which

the control means generates a lamp on/off control signal.

5. A portable telephone according to claim 4, in which

lamp driving means are provided for providing

power to the panel lamps in response to the lamp-on control signal from the control means to turn the panel lamps on, and for cutting off the power to the panel lamps in response to the lamp off control signal to turn the panel lamps off.

6. A portable telephone according to any preceding claim, in which the flip comprises a first coupling means and the body comprises a second coupling means at a location in proximity with the first coupling means when the flip is closed,

whereby, when the flip is closed, the first and second coupling means interact as a result of their proximity to one another to indicate the open/closed status of the flip to the control means

7. A portable telephone according to claim 6, in which the first coupling means comprises a magnet.

8. A portable telephone according to claim 7, in which the magnet is a permanent magnet.

9. A portable telephone according to claim 7 or 8, in which the second coupling means comprises a magnet switch mounted on the body of the telephone at a location corresponding to the location of the magnet in the flip when the flip is closed, whereby the magnet switch is turned on or off depending on the proximity of the magnet in the flip and hence the open/closed status of the flip.

10. A portable telephone according to any preceding claim, in which the panel lamps are arranged to brighten the circumferences of key buttons in the panel.

11. A portable telephone according to any preceding claim, in which the flip comprises a microphone or

speaker of the telephone.

12. A portable telephone substantially as described herein with reference to fig. 1 and/or as illustrated in fig. 2.

The Patent Office

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Claims searched:	1 to 11	**Date of search:**	17 March 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H4J (JK)

Int Cl (Ed.6): H04M 1/02, 22

Other: Online: WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	WO 91/07836 A1 (MOTOROLA) see page 12 lines 21 to 31 and claims 8 & 9	1-5,11
X	WPI Abstract Accession No. 95-150822/20 & JP 070074691 A (SANYO) 17.03.95 (see abstract)	1-5,11

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.